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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/721,260	11/26/2003	Toyokazu Sakata	TAI 145	6433
23995	7590	01/05/2006	EXAMINER	
RABIN & Berdo, PC 1101 14TH STREET, NW SUITE 500 WASHINGTON, DC 20005			VINH, LAN	
			ART UNIT	PAPER NUMBER
			1765	

DATE MAILED: 01/05/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/721,260

**Applicant(s)**

SAKATA, TOYOKAZU

**Examiner**

Lan Vinh

**Art Unit**

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 20 October 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- 1) ☒ Certified copies of the priority documents have been received.
  - 2) ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - 3) ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 10-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Tsai et al (US 2003/0008511 A1)

Tsai discloses a method for forming a dual-damascene comprises the steps of:

forming a first contact/interconnection 12 (col 2, paragraph 0036)

forming an interlayer low k dielectric layer 16 (SOG) on the contact 12 (col 4, paragraph 0041)

forming a contact hole 31 for electrically connecting the contact 12 and second metal/contact 34, in the layer 16 (fig. 6)

forming a trench/groove for embedding the second metal in the layer 16/interlayer dielectric layer (col 6, paragraph 0056, fig. 4)

plasma etching the contact hole using a gas mixture including C<sub>4</sub>F<sub>8</sub>, oxygen and argon gas under a pressure of 1.5 mTorr-10 Torr, which encompasses the claimed range of 60 mTorr or higher and RF power output of 500 Watts, which encompasses the claimed range of 600 Watts or less (col 6, paragraph 0055)

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The limitations of claims 11-12 have been discussed above

Regarding claims 13, Tsai discloses forming an etch stop layer 18 formed above the layer 16 (col 6, paragraph 0057)

Regarding claim 14, Tsai discloses the ratio of oxygen to a combined fluorocarbon gas and oxygen is 500 sccm of oxygen :500 sccm of C<sub>4</sub>F<sub>8</sub>+500 sccm of oxygen (500 sccm:1000 sccm or approximately 50%) (col 5, paragraph 0046)

Regarding claim 15, Tsai discloses plasma etching the contact hole and trench using a gas mixture including C<sub>4</sub>F<sub>8</sub>, oxygen and argon gas under a pressure of 1.5 mTorr-10 Torr, which encompasses the claimed range of 60 mTorr or higher and RF power output of 500 Watts, which encompasses the claimed range of 600 Watts or less (col 6, paragraph 0054, 0055)

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-9 rejected under 35 U.S.C. 103(a) as being unpatentable over Li et al (US 2003/0024902 A1) in view of Leung et al (US 6,897,154)

Li discloses a method for etching low-k dielectric material. The method comprises the steps of:

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plasma etching an interlayer insulating comprises low-k film 38 using a gas mixture including C<sub>4</sub>F<sub>8</sub>/fluorocarbon gas, oxygen and Ar (col 3, paragraph 0023, col 6, paragraph 0047, Table 4), and under a pressure of 60-200 mTorr, which reads on the claimed range of 60-70 mTorr and a RF power of 50-1000 Watts (col 5, paragraph 0034, 0035)

Unlike the instant claimed inventions as per claims 1, 5, Li fails to specifically disclose conducting the plasma etching using RF power 400-600W

Leung discloses a method for etching low-k comprises the step of conducting the plasma etching using RF power 600W-1500 W (col 7, lines 20-22)

Since Li discloses conducting the plasma etching of the low-k material using RF power in the range of 50-1000 Watts, one skilled in the art at the time the invention was made would have found it obvious to modify Li by conducting the plasma etching using RF power of 600 W as per Leung because Leung discloses that main etching/etching using RF power of 600 W provides high etch rate and highly selective etching of the low-k dielectric layer (col 4, lines 22-25; col 7, lines 20-22)

The limitations of claims 2, 6 have been discussed above

Regarding claims 3, 7, Li discloses that the low-k dielectric film comprises SOG (col 3, paragraph 0025)

Regarding claims 4, 9, Li discloses the ratio of oxygen to a combined fluorocarbon gas and oxygen is 5 sccm of oxygen:12 sccm of C<sub>4</sub>F<sub>8</sub>+5 sccm of oxygen (5 sccm/17 sccm or approximately 29%) ( table 4)

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Regarding claim 8, Li discloses forming an etch stop layer 36 above the low-k dielectric layer 38 (col 3, paragraph 0023)

***Response to Arguments***

5. Applicant's arguments filed 10/20/2005 have been fully considered but they are not persuasive.

Applicants argue that Li's 60-200 mTorr pressure range is 14 times as large as the 60-70 mT-Torr pressure range recited in claims 1 and 5, and Li's 50-1,000 watt power range is almost five times as large as the 400-600 W power as claimed in claims 1 and 5. This argument is unpersuasive because while it is true that Li's 60-200 mTorr pressure range is 14 times as large as the 60-70 mT-Torr pressure range recited in claims 1 and 5, it is also true that one endpoint 60 mTorr of Li pressure range certainly reads on one endpoint of the claimed range of 60-70 mTorr. In addition, although Li's 50-1,000 watt power range is almost five times as large as the 400-600 W power as claimed in claims 1 and 5, Li power range encompasses the claimed range of 400-600 W. Thus, one skilled in the art at the time the invention was made would have found it obvious to modify Li by conducting the plasma etching using a specific RF power (including the specific claim range) as per Leung to produce the claimed invention. It is also noted that it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980)

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The applicants argue that section 3 of the Office Action identifies Tsai's layer 16 as the inter layer insulating film of claim 10. But the opening portion corresponding to the interconnection groove is formed in Tsai's layer 20. When the Tsai reference is interpreted appropriately with respect to the language of claim 10, it is respectfully submitted that Tsai's interconnection groove is formed in his dielectric layer 20. This argument is unpersuasive because as seen in figs. 5 and 6 of Tsai, the groove formed in low-k dielectric layer 16 also embeds/buries the second interconnection 34, as required by claim 10

6. Applicant's amendment necessitated the new ground(s) of rejection of claims 1-9 presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471.

The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



LV

December 30, 2005